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ABSTRACT

This study compared the effects of multi-age classroom strategies to those of traditional classroom strategies on the academic achievement of fourth grade students in reading and math. Standardized test scores from 20 fourth-grade students in two multi-age third- and fourth-grade classrooms were compared to the scores of 20 students from 7 traditional fourth-grade classrooms. The Stanford Achievement Test (SAT), ninth edition was used as the test instrument. Scores from the students' third grade test in the 1996-97 school year were compared to their scores from the fourth grade test in reading and math by applying T-tests to the data. Analysis of the data revealed no difference in reading or math achievement between students taught in a multi-age classroom and those from a traditional classroom. (JPB)

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A STUDY COMPARING THE EFFECT OF MULTIAGE EDUCATION PRACTICES VERSUS TRADITIONAL EDUCATION PRACTICES ON ACADEMIC ACHIEVEMENT

ED 424 008

A Thesis

Presented to

The Faculty of the Master of Arts Degree Program

Salem-Teikyo University

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts in Education

by Janet L. Gorrell
August, 1998

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ABSTRACT

A STUDY COMPARING THE EFFECT OF MULTIAGE EDUCATION PRACTICES VERSUS TRADITIONAL EDUCATION PRACTICES ON ACADEMIC ACHIEVEMENT

by Janet L. Gorrell

This study investigated the effect multiage classroom strategies had on the academic achievement of students compared to the effect traditional classroom strategies had on the academic achievement of students in reading and math as measured by standardized test scores.

There was a need to gather information on this topic because parents and educators often want to know if multiage education favorably enhances academic achievement. Educational systems across our country are always trying to deliver the best quality learning situations for students that produce academic excellence.

This investigation explored the following research questions:

1. What was the effect of a multiage instructional setting on reading and math for a heterogeneous group of students based upon SAT9 test scores for the 1996-1997 and 1997-1998 school years?

2. What was the effect of a traditional, single grade instructional setting on reading and math for a heterogeneous group of students based upon SAT9 test scores for the 1996-1997 and 1997-1998 school years?

3. What comparisons may be drawn regarding the effect of multiage and traditional instruction upon reading and math?

Scores from twenty fourth grade students in two multiage 3rd and 4th grade classrooms were compared to the scores from twenty, randomly chosen, fourth grade students from seven traditional classrooms. The Stanford Achievement Test, ninth edition, was used as the test instrument. Scores from the students' 3rd grade test in the 1996-1997 school year were compared to their scores from the 4th grade test from the1997-1998 school year in reading and in math by applying t tests to the data. Analysis of the data revealed that, statistically, no difference in achievement in reading or in math was measured by standardized tests when students were taught in a multiage or in a traditional classroom.

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Chapter 1

INTRODUCTION

The goal of the American educational system has been to provide learning environments which enhance the acquiring of knowledge for its citizenry. Multiage education is another strategy of delivering education to our children. The goal of this work is to compare achievement in reading and math in the multiage classroom to achievement in reading and math in the traditional classroom.

Research Questions

1. What was the effect of a multiage instructional setting on reading and math for a heterogeneous group of students based upon SAT9 test scores for the 1996-1997 and 1997-1998 school years?
2. What was the effect of a traditional, single grade instructional setting on reading and math for a heterogeneous group of students based upon SAT9 test scores for the 1996-1997 and 1997-1998 school years?
3. What comparisons may be drawn regarding the effect of multiage and traditional instruction upon reading and math achievement?

Hypothesis

Ho: There will be no difference in achievement in reading and math as measured by standardized tests when students are taught in a multiage or in a traditional classroom.

H1: Students taught in a multiage classroom will score significantly higher on reading and math as measured by standardized tests than students taught in a traditional classroom.

Limitations

This study contained the following limitations:

1. The sample was limited to forty students at a large grade school in Clarksburg, West Virginia.
2. The study was limited to fourth grade students.
3. The sample was limited to students in two, third-fourth grade multiage classrooms and to students randomly chosen from seven traditional fourth grade classrooms.
4. The study was limited to the 1996-1997 and 1997-1998 school years.
5. The study was limited to SAT9 scores in reading and math.

Definitions of Terms

Authentic assessment-A type of assessment that reflects students' actual learning experiences. These may be documented by observations, anecdotal records, work samples, journals, and conferences. This type of assessment is ongoing and places less emphasis on letter grades and test scores (Grant & Johnson, 1995).

Continuous progress-Children move from easier to more difficult material at their own pace, rather than being promoted once a year (Gaustad, 1992).

Cooperative learning-Sometimes called collaborative learning; instructional method in which students of all levels of performance work together in small groups to accomplish academic tasks and to develop social skills that promote positive interdependence; the four basic steps are:

1. form groups of two to five students (ideally four)

2. ensure that groups are heterogeneous

3. state a goal or objective for the group

4. assign a unique role of job to each member (101 Factory for Teachers).

Developmentally appropriate practice-An educational practice that matches curriculum to each child's stage of development, meeting the individual needs of the child (Theilheimer, 1993).

Integrated curriculum-Curriculum that is developed to foster children's physical, social, emotional, and intellectual growth is referred to as integrated curriculum (Gaustad, 1992)

Mental age-A measure of the mental development or intelligence of an individual in terms of the average performance of a normal individual of various ages. It is determined by a series of tests that are prepared to show natural intelligence rather then the result of education (Barnhart, C. Ed., 1987)

Multiage classroom-The practice of teaching children of different ages and ability levels together without dividing them or the curriculum into steps labeled by designations (Veenman, 1995). Synonyms for multiage are mixed-aged, ungraded, nongraded, non-age-graded, family grouping, and multilevel.

Multigrade classroom-Two grades are taught by one teacher in one classroom as two separate curricula. Multigrade is often referred to as a split grade or a combination class. It may be a means used to cope with uneven class size or a declining enrollment (Veenman, 1995).

Open classroom-A classroom, especially at the elementary level, in which the activities are completely informal and the teacher's function is to guide or advise rather than to give formal instruction (Barnhart, C. Ed., 1987).

Proximal development-the distance between the student's actual developmental level as determined by independent problem solving and the level of potential

development as determined through problem solving under adult guidance or in collaboration with more capable peers (Vygotsky, 1978).

Successive approximations-Students returning repeatedly to skills and knowledge in order to become more expert (Politano & Davies, 1994).

Team teaching-An educational program in which several teachers skilled in particular subjects alternately lecture, instruct, or otherwise meet with a group of students drawn from several regular classes (Barnhart, C. Ed., 1987).

Tracking-An educational system in which students are grouped according to ability or aptitude as shown in standardized tests (Barnhart C. Ed., 1987).

Traditional classroom-An educational system that places a student in a single grade for one year with an age-specific curriculum. The child who does not successfully complete this curriculum often repeats it. Letter grades and standardized achievement tests may be used to measure success (Grant, et al., 1995).

Assumptions

The following assumptions were made concerning this study:

1. The sample was adequate in size.
2. The students in the study were typical fourth graders.
3. The test instrument was valid.
4. The time for the study was adequate.

Importance of the Study

Schools across the United States are looking for better ways to educate our young people. The move to the multiage concept has increased over the past few years. Black (1993) cautioned that many of the studies done on student performance in the multiage classroom were conducted before 1990. Slavin

(1992) further warned that it was hard to determine just how relevant these earlier findings would be to today's academic achievement in the nongraded setting. It is always well to consider the outcome of a new educational practice and measure its import upon students before embracing it as our own.

Chapter 2

REVIEW OF THE LITERATURE

Introduction

The purpose of this literature review was to describe multiage education and to compare academic achievement in the multiage classroom to academic achievement in the traditional classroom. The review of the literature included the following topics: definition, history, philosophy, components and implementation of multiage education. The review also compared academic achievement in the multiage and traditional classrooms.

Definition

"In a multiage classroom children of differing ages work together with each child participating to the best of his or her abilities" (Osin & Lesgold, 1996). This educational approach acknowledges that children learn at different rates and in different ways (Gaustad,1996). Miller (1996) defined multiage education as "two or more grade levels intentionally blended to improve learning" (p.4).

Multiage classrooms are often confused with multigrade classrooms. There is an important distinction between these two models of classroom organization. Multiage grouping does not acknowledge grade levels of students and instruction of curriculum is directed to the group as a whole, rather than being broken down into two or more distinct grade levels. In a multigrade classroom different grades are taught by one teacher with separate curricula for each grade (Montes,1996).

Multigrade classrooms, also called split-grade or combination classes, have often been implemented as a response to declining student enrollment or uneven class size. Multiage classes are organized for the purpose of benefiting different age children without segregating by grade levels (Veenman,1996).

Multiage classrooms have also been referred to as nongraded, ungraded, non-age-graded, mixed-age, family grouping, and multilevel classes. There have been small differences in each label. The real importance does not rest with the title but with the practice of developmentally appropriate, continuous progress education (Black,1993).

Shanker (1994) described developmentally appropriate practice as:

1. curriculum based on problem solving activities;
2. hands-on activities that encouraged investigation by the student;
3. classrooms supplied with "real-world" materials;
4. curriculum planned with children's interests as a focus;
5. work paced for individual student's progress;
6. cross-age and cross-ability interaction;
7. classroom space used in flexible patterns;
8. observing children with an emphasis on how they learn;
9. evaluation by observation and collections of children's work over time.

History

The early one room schools of the United Stated provided a setting for the beginnings of mixed-age education. Students of all ages attended school together, learning from the teacher and from each other (Grant & Johnson, 1995).

In the mid 1800s, the graded school system was introduced to America by Horace Mann. Mann believed that a democracy required educated citizens (Grant, et al.,1995). Mass public education called for an efficient means of handling a growing population of students. The answer was to divide students by age and the graded system was born (Gaustad, 1992). This system was accepted across the United States and has remained the standard to present (Goodlad & Anderson, 1987).

In the 1950s through the 1970s an attempt was directed at matching an understanding of child growth and development with nongradedness. The open classroom and team teaching were reflections of this movement in education (Anderson,1993).

In the 1990s, reform movements by educators and the public have tried to meet the needs of a widely diverse society. Nongraded primary education has been one response to these needs (Gaustad, 1992).

Philosophy

Mixed-age models of education are based on the developmental theories of Jean Piaget, Jerome Bruner, and others. These theories recognize that children learn at varying rates. One child's mental age may vary from another child by as much as four years. Proponents of multiage education stress the importance of extending the age range in a classroom to accommodate this variance in mental age. A policy of not retaining a child in a set grade, but allowing that child to progress in the same classroom over a period of time encourages a positive, successful, situation for a child, rather than one of failure (Cushman,1990).

Components of Multiage Education:

Multiple Year Placement

Children benefitted from being with one teacher for a period of two or more years. The transition from one grade and teacher to another grade and teacher can be difficult for children. The time required to establish new rules and routines and to adjust to a new teaching style can be eliminated. Both student and teacher can start in that second school year together by picking up where they left off in the spring (Mazzuchi & Brooks, 1992). A sense of community and a more stable

relationship developed when students and teachers related to each other over longer periods of time (Montes, 1996).

Oberlander (1989) reported her experience with setting up multiage classrooms. Approximately 150 children, ages 5-8 years old, were assigned to five teachers. These students stayed together with the same teacher until they mastered a set of skills and then moved on to other classrooms. Students were mixed heterogeneously as high, medium, and low achievers in each class. Special education children, minority students, and a mix of boys and girls were placed in each room. The program was tailored to meet the needs of the students.

Extended time in a classroom allowed students to progress at their own speed. This continuous progress encourages less anxiety about achieving at a specific pace. The stigma of retention is alleviated and a child can remain in a group as long as needed to master appropriate skills and then advance (Cushman, 1990).

Jeanroy (1996) described a multiage program that was implemented at a school of approximately 500 students in Washington state. Before implementation of the multiage program, 30 to 35 students were being retained each year. After four years of implementation, only two or three students were being retained each year. Students in the lower primary grades who were having academic, social, or other delays were placed horizontally to another classroom where they were given more time to develop needed skills. Only students at the end of the fifth grade were retained if they displayed serious emotional or social problems.

Mazzuchi, et al., (1992) concluded that "the gift of time" was the greatest advantage of multiple year placements. This accommodates varying learning rates of all children.

Peer Tutoring

Peer tutoring is reported as an important part of the multiage classroom. Older or more able students take on the role of mentors for younger or less able students (Chapman, 1995). The older students have opportunities to return again to skills and knowledge in order to become more expert. Language acquisition researchers refer to this process as "successive approximations". It is a process of getting better and better at each try (Politano & Davies, 1994).

Younger students are given the chance to visit the world of the older students. They may try more difficult tasks and then return to less difficult undertakings. Younger children also provide less mature older children with opportunities for successful interaction (Shanker, 1991). Younger students can learn social and intellectual skills from this association with the older students (Theilheimer , 1993).

Taylor, Hanson, Justice-Swanson, and Watts (1997) reported on a reading intervention program that combined an enrichment class with a cross-age tutoring program for struggling readers. The program matched struggling readers, ages 7- to 8 years-old, with tutors, ages 9-to 10 years-old, who were also behind in reading. The program began in the fall and ended in mid-April. At the end of the school year both groups of students were assessed in oral reading and by standardized tests. Significant gains in reading for both students and tutors were described. Seventy-five percent of the children who entered 2nd grade unable to read at the primer level could read from a grade-level basal with 90% accuracy or better by the end of the 21-week cross-age tutoring program. None of the control group children were able to decode a grade level passage this well. Cross-age tutoring, a component of the multiage classroom, was reported to have a positive impact on children's reading achievement.

Emphasis on Students as Individual Learners

Anderson and Pavan (1993) listed an acceptance and respect for individual differences in the pupil population as a first point in their operational definition of nongraded schools. They included with this a focus on a wide variety of instructional approaches to respond to individual student needs. As teachers became more familiar with a child's needs, interests, and abilities, consideration was given to providing individualized learning opportunities that matched that child's uniqueness.

Integrated Curriculum and Theme Study

Multiage classes have centered instruction around themes which spill over into many areas of the student's day. Students were often involved in theme selections, choosing from their own interests. Once chosen, a theme planning session integrated reading, writing, and oral language components. Social studies, science, math, and art were also focused around the theme (Bingham, Dorta, McClaskey, and O'Keefe, 1995).

Flexible Grouping and Cooperative Learning

Diversity rather than uniformity among students was the expected norm in the multiage classroom. This opened the door for flexible grouping (Cushman, 1990).

Examples of flexible grouping that might be used in the multiage configuration are outlined in the Language Arts Handbook for Primary-Grade Teachers in Multi-Graded Classrooms (1988).

1. Problem-Solving: Students are grouped to solve a common topic; such as, the main idea of a story.

2. Needs-Requirement: Students are grouped for instruction on a particular skill; such as, practice on multiplication facts.

3.Reinforcement: Students are grouped for more work on a concept or area in which they are weak; such as identifying fact and opinion.

4. Interest: Students are grouped by topics having a specific interest for them; such as, writing limericks.

5. Learning Style: Students are grouped as to their style of acquiring knowledge; such as kinesthetic learners may use felt letters to practice spelling words.

These examples of grouping mix age, ability, and interest in various forms. Students cooperate with each other across their strengths, weaknesses, ages, and interests to learn from each other. Cooperative learning is a hallmark of the multiage classroom where students develop a spirit of cooperation and a sense of community. The spotlight is turned from competition among peers to achievement of one's best (Anderson, et al., 1993). Social skills and attitudes of responsibility flourish in these small groups when students experience a comfort level sharing with their peers (Cushman, 1990).

Chapman (1995) discussed Vygotsky's (1978) zone of proximal development in relation to the grouping process. Vygotsky stated that each student has an "attained" developmental level. This is a competency zone in which the student feels comfortable and is able to do what is required in a particular learning situation. Beyond this each student has a "learning zone". This is an area within reach and can be attained by a student with effort. Beyond this a student has a "frustration zone". The job of the teacher is to balance grouping and learning situations for students between the attained and learning zone levels.

Assessment and Evaluation

The objective of assessment in the multiage classroom is to focus on individual progress over time rather than comparing one student's progress to another student's achievement. Emphasis is moved away from competition and comparison to authentic assessment (Bingham, et al., 1995).

Authentic assessment is not just one method of assessing. It includes many ways of looking at a student's progress. Observations, portfolio collections, and interviewing are examples of this holistic assessment. Each method brings the teacher's understanding of how learning takes place to the child's expression of their acquired knowledge (Routman, 1994).

Bringing evaluation to assessment allows the student and teacher to reflect on and appraise a student's work. Together, they set a new direction for advancing learning and reinforcing weak areas (Routman, 1994).

Reports to parents are often "lists of accomplishments, projects currently underway, and next-term goals" (Calkins,1992 p. 11). Students have a role in critiquing their own progress and planning for the future. The goal is to build self-motivation and self-satisfaction into their learning (Calkins, 1992).

Test scores and report card grades are not the framework for organizing students into groups or classes in multiage practice (Black, 1993). Tracking by achievement test scores often overlooks social and emotional needs of children (Calkins, 1992). Heterogeneous grouping of ability levels and ages accommodates diversity rather than limiting classes to high, average or low level ability students (Grant, et al., 1995).

A Comparison of Achievement in the Multiage Classroom to Achievement in the Traditional Classroom

Pavan (1973) first reported on nongraded education approximately twenty years ago. Anderson and Pavan (1993) have recently published a new survey of the research literature that added 64 new studies to her original work. Their findings on academic achievement and mental-emotional health disclosed that most of these new studies showed a neutral outcome when groups of graded and nongraded students were compared. They further stated that outcomes favoring graded groups were rare and that both the quantity and quality of results in favor of the nongraded approach are growing (Anderson, et al., 1993).

Anderson, et al., (1993) also explained that a nongraded situation most benefits "boys, blacks, underachievers, and students from lower socioeconomic groups, with the benefits increasing the longer that children remain in that environment". They supported the idea that nongradedness works best when teachers team teach in settings of multiage groups of children (Anderson, et al., 1993).

Miller (1989) compared graded and nongraded programs. He concluded that multiage programs "are as effective as single-grade classes in terms of academic achievement and superior in terms of student attitudes toward school and self" (Gaustad, 1992).

Jeanroy (1996) reported on a random sample of 120 students from a 480 student population school. Students were tested each year of a 4 year multiage implementation program to assess grade level equivalency in reading and math. The Multi-Level Academic Survey Test was used as an end -of -year assessment. Students tested 2.4 months ahead in reading and .4 months ahead in math in comparison with grade equivalent norms. In previous years children had scored in

the 35th to 45th percentile range on the CAT and MAT assessments in reading and math in the traditional classroom settings.

Black (1993) related that no studies in her research showed students in multiage classes learning less than students in single grade classes. Also, few studies showed that multiage students learn more than single grade students.

Pratt (1986) reviewed 30 comparisons of single grade classes with multiage classes. His work explained that 10 of the 28 academic achievement studies and 9 of the 15 social-emotional studies favored multiage classes. Five achievement and 0 social-emotional studies favored single grade classes. He concluded that "the weight of this evidence strongly suggests that multiage classrooms have many benefits to children that cannot be as fully realized in age-segregated classrooms" (p. 111).

Veenman (1995) reviewed 56 studies in his best-evidence synthesis comparing single-grade to multigrade and multiage classes. His research found no achievement differences (median effect -.03 for multiage classes) and small affective effects favoring multiage classes (median effect sizes of +.15). He stressed that "these classes are simply no worse, and simply no better, than single-grade or single-age classes" (p. 367).

In response to Veenman's research, Mason and Burns (1996) concurred with the finding that there is no difference between achievement in single-grade and multiage classes. The researchers went on to state that they did disagree, however, with Veenman's interpretation of his findings.

Veenman (1995) expressed lack of cross-grade grouping, studies biased in favor of multiage classes, and ill-prepared teachers as explanations for his finding of no difference in achievement. He went on to name inappropriate materials, increased teacher preparation time, and increased classroom management demands, as further explanations for a no difference finding.

Mason, et al., (1996) proposed two factors that they felt were more likely explanations for the no difference in achievement finding. The authors felt that selection bias favoring better students and better teachers was a major factor in this research. They stated that previous research has often suggested that principals placed more able, independent, cooperative students in multiage classrooms to lessen the burden on teachers. (Burns & Mason, 1995).

Mason , et al.,(1996) also suggested that multiage classes are more often assigned to better teachers. Galluzo, Cook, Minx, Hoover, Skaggs, and Herrick (1990) reported that principals relied upon reputation as a significant factor in assigning teachers to mixed grade classes. These authors also revealed that the mixed age classes often received aides, fewer students, and teacher input into student selection.

Mason, et al., (1996) suggest that if these factors do influence the formation of mixed age classes, then consideration must be given to this in assessing the outcome evidence. The authors concluded that mixed age classes have "at least a small negative effect on achievement" (p. 307). They stated that if better students are placed with better teachers, and the academic achievement is the same as for single grade students, then there must be less effective instruction in the multigrade class as a result of the difficult setting in which these teachers must teach.

Cushman (1990) concluded that study results generally show improvement in language skills in the multiage classroom. She further stated that children on the developmental and academic ends of the spectrum benefit most from multiage placement. She listed "boys, blacks, the slow and the gifted, and children with low self-esteem" (p.118) as benefitting most. Cushman further implied that researchers report that bright, immature children benefit from an academically challenging setting with a social environment that meets the needs of a younger child.

According to Katz (1990), taking part in mixed age groups benefits both younger and older children socially and cognitively. She reported that discipline problems were reduced and cooperation and positive social interaction increased.

Gutierrez and Slavin (1992) in their best evidence synthesis of the achievement effects of the nongraded elementary school reported the following. Results showed consistent, positive achievement effects when simple types of nongrading were used early in the schooling process. Cross-grade grouping for one subject showed a median effect size of +.46 and cross-grade grouping for many subjects showed a median effect size of +.34. When nongraded situations depended heavily upon the use of individualization, the results were found to be less successful, with a median effect of +.02.

Implementation of Multiage Practices

Miller (1996) suggested key steps to the successful implementation of multiage practices.

1. Everyone involved in this new venture reviewed research-based information before planning implementation.

2. There is not a singular correct way to set up a multiage class or school. You must develop your own program.

3. Choosing bottom-up or top-down, independently of the other, was ineffective. Implementation is best developed from both directions simultaneously.

4. Multiage programs require major change in attitudes toward education and how children learn. This can be difficult for teachers and administrators who have been used to working in the traditional, single graded setting.

5. Implementation takes a long time. It is best viewed as a long-term investment for all involved.

6. Small, well thought out steps make implementation easier and more successful. Trying too much too quickly leads to frustration and failure for all stakeholders.

Goodlad, et al.,(1987) described teacher and parent support as the most important factor to the success of the implementation and functioning of a multiage program. Black (1993) emphasized that parents and teachers are used to thinking of children as being in a certain grade level. Schools were wise to inform parents about a new multiage program and what it would mean for their child.

Anderson (1993) characterized the obstacles to the practice of multiage education as mostly ones of habit and attitude. Teachers and administrators have long depended upon grade leveled teaching materials and evaluation instruments. Multiage teaching requires an open attitude toward sharing ideas and collaborative team teaching with others, rather than seclusion in self-contained, single teacher-directed classrooms.

Jeanroy (1996) reported on the problem of teacher burn-out in implementing a multiage program. Teachers expressed frustration at spending evenings and weekends in planning new materials to meet the requirements of theme teaching.

Gaustad (1992) commented on some of the problems for teachers making the change to a multiage classroom. Teachers reported a need for more preparation time and substantially more training to meet the rigors of a mixed-age classroom. Teachers also described more time required to evaluate collections of student work, making descriptive comments rather than grading multiple-choice type tests.

Mason, et al., (1996) expressed concerns about implementing a multiage program. They listed a requirement for more planning time, more difficult to teach, and diminished curriculum coverage as major considerations before starting into a multiage situation. They also commented on a possible attraction of both teachers

and parents to being involved in something novel rather than a realistic view of what multiage would mean over the long term of commitment.

Cushman (1990) reflected on the reality of limited numbers of teacher education programs at the college level which give comprehensive training in mixed-age education. Black (1993) added to this by suggesting that lots of staff development, coaching, and support would be necessary for new teachers just starting their careers in education in order for these teachers to be successful in the multiage classroom.

Cushman (1990) and Black (1993) both discussed the power of textbooks and textbook publishing companies to slow the growth of mixed-age approaches to education. Scope and sequence models have encouraged teachers to think in terms of a lock-step system of teaching. Mixing different age children together puts a stumbling block in the path of this method of teaching. Cushman (1990) commented that the whole language movement has already pushed publishers to move in this direction.

Anderson (1993) stressed the importance of the principal's role as facilitator in this process. Teachers and principals who worked collaboratively and communicated concerns, goals, and expectations were more likely to succeed in their move to mixed-age education. Gaustad (1996) listed ways in which the principal can support change.

1. Provide professional development opportunities.
2. Accept teachers' varying levels of comfort with new methods and approaches to teaching.
3. Facilitate positive interactions between all involved.
4. Check on the progress of implementation at regular intervals.
5. Provide praise, feedback and suggestions regularly.
6. Be available to help when problems arise.

Boards of Education can help implement the change to multiage programs by removing requirements for use of grade-level textbooks in all classrooms. Another issue for teachers and administrators is the practice of basing accountability evaluation on standardized test results. Gaustad (1992) suggested that boards could free teachers to focus on mastering new teaching methods by waiving these practices.

The 1990 Kentucky Education Reform Act (KERA) required the implementation of multiage education in the primary schools as part of a statewide education reform (Osin, et al., 1996). Viadero (1996) reported that results from Kentucky's testing program revealed that 4th graders' scores are improving more rapidly than the scores of 8th and 12th graders. She further commented that of the 4th, 8th, and 12th graders, only the 4th graders are required to be taught in multiage classrooms. Viadero added, however, that it was difficult to pinpoint this success only to multiage practices. The state has also added a new testing program and rewards and sanctions schools according to their results on the tests. The Cincinnati Enquirer (1998) reported that many schools in Kentucky have moved back to more traditional classrooms since 1996. At that time schools were allowed to choose the amount of the multiage primary program they wanted to use.

Anderson (1993) pointed out that teachers are sometimes resentful of administrative decisions to embrace any new program that comes along. Teachers, as well, may be skeptical of programs which sound good in theory, but which may be hard to implement in practical ways. He added that some teachers have a limited belief that all children can learn and feel that report card grades and fear of retention are good motivators.

On the plus side, Anderson (1993) said that teachers of today are better educated as to how children learn and are often more accepting of individual

differences. Collaboration among educational professionals and a desire to meet the needs of today's students go a long way in implementing a multiage program.

Conclusion

" Multiage education is not a quick fix for every educational problem" (Grant, et al., 1995). Reassigning children of mixed ages into one classroom does not create multiage education (Black, 1993). It is a philosophical shift in thinking, as well as a shift to new practices in teaching and organizing instructional and learning experiences.

Every classroom is in reality a multiage classroom. Each classroom has mixes of ages, abilities, and developmental levels (Chapman, 1995). The practices described in this literature review are not unique to multiage education. The academic achievement reported in the research review was, more often than not, neutral when comparing multiage classrooms and traditional classrooms. Authors were optimistic about the findings that suggested that multiage practices did have a positive effect on student attitude toward school and learning. Perhaps at the primary level of education this is indeed a worthwhile achievement. Multiage education's greatest gift may be that it enables us to transform the way we think about learning and teaching by helping us to accept and encourage diversity in children (Chapman, 1995).

Chapter 3
METHOD

Subjects

The subjects for this study included forty students who were fourth graders during the 1997-98 school year at Nutter Fort Intermediate School in Nutter Fort, West Virginia.

The control group was composed of twenty randomly chosen students, 10 male and 10 female, who were enrolled in traditional fourth grade classrooms. The experimental group was composed of twenty students, 10 male and 10 female, who were enrolled in multiage, grade three and four, classrooms. These twenty students represented the fourth graders in two multiage rooms. This group of forty students were a part of a fourth grade class of 196 students, according to the County Superintendent's Second Month Attendance Report for the month of November, 1997.

Nutter Fort Grade School is a consolidated school receiving students from the Nutter Fort and Clarksburg, West Virginia areas. The school opened its doors for the 1993-94 school year for the first time. The grade school is composed of Nutter Fort Primary, which had an enrollment of 627 students, and of Nutter Fort Intermediate, which had an enrollment of 607 students in November of 1997.

The Clarksburg-Nutter Fort area had an urban population of 19,854 people according to the 1990 census. Nutter Fort Grade School represents a modern, well-equipped, school in north central West Virginia.

Design

The research groups were formed in two ways. Twenty students from traditional fourth grade classrooms were randomly selected for the control group. Twenty students from the only two existing grade three-four multiage classrooms were assigned to the experimental group. The multiage group was composed of 10 males and 10 females. The experimental group was matched to this.

Procedure

The data were derived from the results of the Stanford Achievement Test (SAT), form S, ninth edition. Results from the third grade test, given the week of April 25, 1997, and from the fourth grade test, given the week of April 3, 1998, were used to conduct the research. The testing is mandated by the West Virginia Department of Education for all students in West Virginia unless excused from standardized testing according to an Individual Educational Plan (IEP). This test is used as the standard measure in determining the success of each county school system in its goal to educate West Virginia's students.

Permission to review SAT9 test scores and to obtain student lists was granted by Mr. Carl Friebel, administrative head of the Department of Planning, Research and Evaluation for Harrison County Schools, and from Mr. Ron Poole, principal of Nutter Fort Intermediate School. Copies of these letters may be found in the Appendix.

Test data used in this study included Total Reading and Total Math scores. Possible correct scores for these subtests were:

3rd Grade Total Reading	84 Items Possible
3rd Grade Total Math	76 Items Possible
4th Grade Total Reading	84 Items Possible
4th Grade Total Math	78 Items Possible

Individual student percentile scores represented a skewed picture of the test data. A statistically more accurate representation of actual student achievement was derived by dividing the number of questions answered correctly by the total number of questions in the subtest. The resulting number was a straight percentage based on 100. Each percentage was carried to the fifth place after the decimal and then rounded to two places. Individual scores were arranged by grade, third or fourth, by type of classroom, traditional or multiage, and by subtest, reading or math. The same 20 students were evaluated in the control group from 3rd to 4th grade, as were the same 20 students in the experimental group from 3rd to 4th grade. Mean scores were computed and different combinations of this data were applied to the appropriate t test formula.

Instrumentation

The Stanford Achievement Test, form S, ninth edition, was used. To quantify the raw data, descriptive statistics were derived from the data. Analyses were made using the hypothesis test for the mean of two independent samples to compare traditional 3rd to multiage 3rd and traditional 4th to multiage 4th groups in reading and in math. Hypothesis test for the mean of two dependent samples was used to compare the multiage 3rd to the multiage 4th group and to compare the traditional 3rd to the traditional 4th group in both reading and in math.

Chapter 4
RESULTS

Raw Data-Reading

The raw scores for the Total Reading and the Total Math subtests of the SAT9 were converted into percentages for each student by dividing the reported number of correct items by the number possible for each subtest. Each student's score was categorized by 3rd or 4th grade, by traditional or multiage classroom, and by reading or math. In order to find t, the following descriptive statistics were obtained for each grouping: sample size, the mean (x), standard deviation (s), variance (s^2), and range. Statdisk Elementary Statistics Program by Mario F. Triola (Password) was used to compute the calculations.

Table 1 provides the results of the treatment of the raw data for the reading subtest, 3rd and 4th grade, traditional and multiage. The sample size for each group is the same. The mean for all four groups was relatively close. Standard deviations, the average that sample scores vary from the mean, are also close. The variance, the mean of the squared deviation scores, provides a closer look at the mean scores. In these groups the 3rd grade multiage group had the greatest variance from the mean and the 4th grade traditional group had the least variance. The 4th grade multiage had the greatest difference between the highest and lowest scores as expressed by the range. The 3rd grade traditional had the least difference between highest and lowest scores.

Table 1

Sample Descriptive Statistics Results

Third and Fourth Grade Reading

Traditional and Multiage

Group	Sample	Mean	Standard Deviation	Variance	Range
3rd Traditional	20	72.797	15.149	229.49	46.430
3rd Multiage	20	75.059	17.250	297.57	57.150
4th Traditional	20	71.666	14.872	221.17	51.190
4th Multiage	20	76.488	16.753	280.66	61.910

Hypothesis Testing

In order to analyze the data from the 3rd and 4th grade reading descriptive statistics, four t tests were performed. The hypothesis test for the mean of two independent samples was run to compare the traditional 3rd group to the multiage 3rd group. This was used as a pre-test and established that both 3rd grade groups were similar at the beginning of the study. The hypothesis test for the mean of two dependent samples was run to compare multiage 3rd to multiage 4th. Another t test for the mean of two dependent samples was run to compare traditional 3rd to traditional 4th. Finally, the t test for the mean of two independent samples was run and determined that both 4th grade groups were similar at the end of the study.

Table 2 shows the results of the first t test for the mean of two independent samples statistically comparing reading scores for a traditional 3rd and a multiage 3rd grade group in reading. The level of significance used in the study was alpha=.05. Since the score obtained on the t test was t=-0.4406, less than the critical t of =2.0244, the null hypothesis that there will be no difference in

achievement in reading as measured by standardized tests when students are taught in a multiage or in a traditional classroom stood. The p-value of 66.20 indicated a 66% probability that the study findings were random, exceeding the established .05 level of significance.

Table 2

Results of Hypothesis Test for the Mean of Two Independent Samples

3rd Grade Reading-Traditional and Multiage

Group	Sample	Mean	St. Dev.	t	Critical t	P-Value
Traditional	20	72.797	15.149			
Multiage	20	75.059	17.250			
				-0.4406	+2.0244	.6620

The second t test statistically compared the scores of the multiage 3rd to the scores of the multiage 4th. The hypothesis test for the mean of two dependent samples was run to compare two sets of data from the same students. The level of significance was .05. The score obtained on the t test was t= -.8369, less than the critical t of +2.0930. The p-value of .4131 or 41% probability of randomness exceeded the .05 level of significance. The test failed to reject the null hypothesis that there will be no difference in achievement in reading as measured by standardized tests when students are taught in a multiage or in a traditional classroom.

Table 3

Results of Hypothesis Test for the Mean of Two Dependent Samples

3rd -4th Grade Reading-Multiage

Sample	Difference Mean	Difference St. Dev.	t	Critical t	P-Value
20	-1.428	7.633	-.8369	+2.0930	.4131

The third t test statistically compared the scores of the traditional 3rd grade reading group to the scores of the 4th grade reading group. Again, because two sets of data were being compared for the same group of students, the hypothesis test for the mean of two dependent samples was used. The level of significance was .05. The score obtained on the t test was t=.6769, less than the critical t of +2.0930. The p-value of .5066 or 51% probability of randomness exceeded the .05 level. Again, the test failed to reject the null hypothesis that there will be no difference in achievement in reading as measured by standardized tests when students are taught in a multiage or in a traditional classroom.

Table 4

Results of Hypothesis Test for the Mean of Two Dependent Samples

3rd-4th Grade Reading-Traditional

Sample	Difference Mean	Difference St. Dev.	t	Critical t	P-Value
20	1.130	7.466	.6769	+2.0930	.5066

The fourth t test statistically compared the scores of the traditional 4th grade reading group to the scores of the multiage 4th grade reading group. The hypothesis test for the mean of two independent samples was used to compare these two groups. The level of significance used in the study was .05 level of significance. Since the score obtained on the t test was t= -.9626, less than the

critical t of +2.0244, the null hypothesis that there will be no difference in achievement in reading as measured by standardized tests when students are taught in a multiage or in a traditional classroom stood. The p-value of .3418 indicated a 34% probability that the study findings were random, exceeding the established .05 level of significance.

Table 5

Results of Hypothesis Test for the Mean of Two Independent Samples

4th Grade Reading-Traditional and Multiage

Group	Sample	Mean	St. Dev.	t	Critical t	P-Value
Traditional	20	71.666	14.872			
Multiage	20	76.488	16.753			
				-.9629	+2.0244	.3418

Raw Data-Math

Table 6 provides the results of the treatment of the raw data for the math subtest, 3rd and 4th grade, traditional and multiage. The sample size for each group is the same. The mean for all four groups was relatively close. Standard deviations, the average that sample scores vary from the mean, are also close. The variance, the mean of the squared deviation scores, provides a closer look at the mean scores. In these groups the 3rd grade multiage had the greatest variance from the mean, and the 4th grade multiage had the least variance. The 3rd grade multiage had the greatest difference between the highest and lowest scores as expressed by the range. The 4th grade traditional had the least difference between the highest and lowest scores.

Table 6

Sample Descriptive Statistics Results

Third and Fourth Grade Math

Traditional and Multiage

Group	Sample	Mean	Standard Deviation	Variance	Range
3rd Traditional	20	76.513	16.999	288.96	57.900
3rd Multiage	20	78.618	17.403	302.86	64.480
4th Traditional	20	73.846	16.257	264.28	47.440
4th Multiage	20	79.436	14.619	213.72	60.260

Hypothesis Testing

In order to analyze the data from the 3rd and 4th grade math descriptive statistics, four t tests were performed. The hypothesis test for the mean of two independent samples was run to compare the traditional 3rd grade group to the multiage 3rd grade group. This was used as a pre-test and established that both 3rd grade groups were similar at the beginning of the study. The hypothesis test for the mean of two dependent samples was run to compare multiage 3rd to multiage 4th. Another t test for the mean of two dependent samples was run to compare traditional 3rd to traditional 4th. Finally, a t test for the mean of two independent samples was run and determined that both 4th grade groups were similar at the end of the study.

Table 7 shows the results of the t test for the mean of two independent samples comparing math scores for a traditional 3rd and a multiage 3rd grade group. The level of significance used in the study was .05. Since the score obtained on the t test was t= -.3870, less than the critical t of +2.0244, the null hypothesis that there will be no difference in achievement in math as measured by a

standardized test when students are taught in a multiage or in a traditional classroom stood. The p-value of .7009 indicated a 70% probability that the study findings were random, exceeding the .05 level of significance.

Table 7

Results of Hypothesis for the Mean of Two Independent Samples

3rd Grade Math -Traditional and Multiage

Group	Sample	Mean	St. Dev.	t	Critical t	P-Value
Traditional	20	76.513	16.999			
Multiage	20	78.618	17.403			
				-.3870	+2.0244	.7009

The second hypothesis test statistically compared the scores of the multiage 3rd to the scores of the multiage 4th in math. The hypothesis test for the mean of two dependent samples was run to compare two sets of data from the same students. The level of significance was .05. The score obtained on the t test was t= -.4919, less than the critical t of +2.0930. The p-value of .6284 or 63% probability of randomness exceeded the .05 level of significance. The test failed to reject the null hypothesis that there will be no difference in achievement in math as measured by a standardized test when students are taught in a multiage or in a traditional classroom.

Table 8

Results of Hypothesis Test for the Mean of Two Dependent Samples

3rd-4th Grade Math-Multiage

Sample	Difference Mean	Difference St. Dev.	t	Critical t	P-Value
20	-.8170	7.428	-.4919	+2.0930	.6284

The third hypothesis test statistically compared the scores of the traditional 3rd math group to the scores of the 4th grade group. Again, because two sets of data were being compared for the same group of students, the hypothesis test for the mean of two dependent samples was used. The level of significance was .05. The score obtained on the t test was 7= 1.3281, less than the critical t of +2.0930. The p-value of .1999 or 20% probability of randomness exceeded the .05 level. Again, the test failed to reject the null hypothesis that there will be no difference in achievement in math as measured by a standardized test when students are taught in a multiage or in a traditional classroom.

Table 9

Results of Hypothesis Test for the Mean of Two Dependent Samples

3rd-4th Grade Math-Traditional

Sample	Difference Mean	Difference St. Dev.	t	Critical t	P-Value
20	2.664	8.969	1.3281	+2.0930	.1999

The fourth hypothesis test statistically compared the scores of the traditional 4th math group to the scores of the multiage 4th math group. The hypothesis for the mean of two independent samples was used to compare these two groups. The level of significance used in the study was .05. Since the score obtained on the t test was t= -1.1434, less than the critical t of +2.0244, the null hypothesis that there will be no difference in achievement in math as measured by a standardized test when students are taught in a multiage or in a traditional classroom stood. The p-value of .2600 indicated a 26% probability that the study findings were random, exceeding the established .05 level of significance.

Table 10

Results of Hypothesis Test for the Mean of Two Independent Samples

4th Grade Math-Traditional and Multiage

Group	Sample	Mean	St. Dev.	t	Critical t	P-Value
Traditional	20	73.846	16.257			
Multiage	20	79.436	14.619			
				_1.1434	+2.0244	.2600

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Chapter 5

SUMMARY, CONCLUSIONS, and RECOMMENDATIONS

Summary

The purpose of this study was to examine the effect of the traditional and the multiage classroom instructional setting on the reading and math standardized test scores of two groups of fourth graders. The different treatments used to analyze the data were:

1. The control group, traditional 3rd, was compared to the experimental group, multiage 3rd, by using the hypothesis test for the mean of two independent samples. The data showed that both groups were similar at the beginning of the study.

2. The multiage 3rd was compared to the multiage 4th by using the results of the hypothesis test for the mean of two dependent samples. The data showed that no significant difference was found between the two means.

3. The traditional 3rd was compared to the traditional 4th by using the results of the hypothesis test for the mean of two dependent samples. The data showed that no significant difference was found between the two means.

4. The traditional 4th was compared to the multiage 4th by using the results of the hypothesis test for the mean of two independent samples. The data showed that both groups were similar at the end of the study.

The same combination of t tests were applied to both the reading standardized test scores and to the math standardized test scores. The data analysis showed the same no difference finding in reading and in math for both groups.

The groups used in this study were fourth grade students at a large grade school in Nutter Fort, West Virginia. The study was conducted in the spring of 1998. The groups consisted of 20 traditional classroom fourth graders and 20 multiage fourth graders in multiage classrooms of grades three and four.

The reading and math subtest scores of the SAT9 were used as raw data to determine if there was any significant difference in the achievement of the two groups, traditional classroom and multiage classroom, between the 3rd and 4th grade. At the .05 level of significance the analysis revealed that there was no significant difference in the groups as determined by hypothesis testing.

Conclusions

There have been numerous studies conducted comparing achievement in the multiage classroom to achievement in the traditional classroom. Many researchers referred to in Chapter 2 found neutral outcomes when comparing these two educational strategies. The results of this study indicate the same neutral findings.

Recommendations

The following recommendations are made for any follow-up study:

1. Perform the study over a longer period of time.

2. Perform the study with larger sample groups, possibly using data from several schools that have both traditional and multiage classes.

3. Perform the study comparing Total Battery SAT test scores.

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APPENDICES

READING AND MATH SCORES: TRADITIONAL STUDENTS

Student	3rd Grade		4th Grade	
	Reading	Math	Reading	Math
1.	76	87	80	86
2.	55	53	63	51
3.	50	55	43	44
4.	44	39	52	46
5.	70	58	62	50
6.	62	76	65	65
7.	83	83	85	88
8.	89	88	85	83
9.	85	88	80	88
10.	88	91	83	88
11.	57	58	50	55
12.	82	89	92	82
13.	87	91	88	83
14.	73	79	60	76
15.	83	97	70	91
16.	85	95	74	85
17.	56	62	57	71
18.	90	89	94	86
19.	56	64	67	69
20.	85	87	85	88

READING AND MATH SCORES: MULTIAGE STUDENTS

Student	3rd Grade		4th Grade	
	Reading	Math	Reading	Math
1.	49	42	54	47
2.	90	88	89	87
3.	36	33	33	37
4.	51	75	58	92
5.	77	82	73	82
6.	87	91	90	97
7.	85	86	88	86
8.	46	47	58	68
9.	93	97	95	87
10.	60	75	74	74
11.	87	89	77	92
12.	92	89	85	86
13.	90	89	93	88
14.	81	86	95	87
15.	82	83	79	78
16.	73	84	56	81
17.	81	82	85	79
18.	89	91	92	87
19.	74	87	76	85
20.	79	76	80	72

339 Tyler Avenue
Clarksburg, West Virginia 26301
April 10, 1998

Ron Poole, Principal
Nutter Fort Intermediate School
1302 Buckhannon Pike
Nutter Fort, West Virginia 26301

Dear Mr. Poole:

I would like to request permission to use SAT9 scores from a group of third and fourth graders for the purpose of research on the effect of multiage practices versus traditional educational practices and academic achievement.

I look forward to sharing my findings with you and the teaching staff at Nutter Fort Intermediate School.

Sincerely,

Janet L. Gorrell

ok RPoole
5-98

BEST COPY AVAILABLE

339 Tyler Ave.
Clarksburg, WV 26301
July1, 1998

Mr. Carl Friebel, Jr., Administrative Assistant
Harrison County Schools
Clarksburg, West Virginia 26301

Dear Mr. Friebel:

I am requesting permission to use SAT9 scores as a part of my thesis project for a Master of Arts Degree at Salem-Teikyo University. I will be using total reading and total math scores from the third grade level, 1996-97 and from the fourth grade level, 1997-98 for a group of forty students at Nutter Fort Grade School.

My thesis topic is a study comparing the effect of multiage education practices versus traditional education practices on the academic achievement of students. I have received permission from Mr. Ron Poole, principal at Nutter Fort Intermediate School , to review these test results. Students will be identified by number only and will in no way be referred to by name in my work. I will use the results of my study only for obtaining this degree and will not benefit financially in any other manner.

I will be glad to share the results of my study with you when completed and look forward to receiving permission from you so that I may finish my thesis project.

My advisor is: Dr. Eva G. van der Giessen
Dept. of Education
Salem Teikyo University
Salem, West Virginia

Sincerely,

Janet L. Gorrell

Janet L. Gorrell

OK
CHJ
7-98

West Virginia Department of Education
Statewide Assessment Program
General Interpretation Guidelines

The Stanford Achievement Test, Ninth Edition provides a measure of student achievement. However, it should not be viewed as the only indicator of student performance. Scores from the SAT-9 provide a picture of student performance at a particular time and under a given set of conditions.

Nationally-normed achievement tests such as the SAT-9 generate scores that can be used for limited comparisons among student groups. Students who took the test are compared to a sample of students who took the test in 1995-96 as part of a "norming" procedure.

The most commonly reported scores from the SAT-9 are "national percentiles" which indicate how well our current students performed in comparison to the 1995-96 norm group. The national percentile indicates the percent of students in the original norm group who obtained scores lower than the current group of students. For example, if a group of sixth grade students score at the 55th percentile in science, then this group of students has scored higher than 55 percent of those students who took the sixth grade science test as part of the 1995-96 norm group.

NOTE: Percentiles are not interval data and therefore are susceptible to distortion if mathematical operations (addition, subtraction, multiplication, division) are attempted on them.